



## **QUARTERLY GROUNDWATER MONITORING REPORT**

**First Quarter 2005 (Eleventh Quarterly)**

**Sampled on January 30, 2005**

**Job # SP-165**

**LOP # 1TDN059**

Crescent Shell  
890 L Street  
Crescent City, California 95531

April 5, 2005

This *Quarterly Groundwater Monitoring Report* was prepared by SounPacific Environmental Services (SounPacific) staff for Big Oil & Tire Co. (BO&T). This report documents the results of the 12th sampling event of the site's groundwater monitoring wells. This report includes data from previous studies that were conducted by Clearwater Group, Inc. (CGI) and file review conducted at Humboldt County Department of Health and Human Services: Division of Environmental Health (HCDEH). The station is located at 890 L Street, Crescent City, California (Figure 1).

### **SITE DESCRIPTION**

The site is located in downtown Crescent City, at the corner of Ninth and L Streets in Crescent City, California. L Street is used as the southbound lane of U.S. Highway 101. The lot remains vacant while the owner continues to investigate the lateral and vertical extent of contamination.

Drainage is controlled by culverts that flow towards the ocean. Sewer and water services are supplied by public utilities (Figure 2).

## **SITE TOPOGRAPHY AND LAND USE**

SounPacific understands that BO&T currently owns the property. The site is a vacant lot. The site topography is relatively flat with the surrounding topography consisting of terrain that descends in an east to southeasterly direction (Figure 1). The surrounding vicinity includes a collection of commercial and residential properties. Skagg Auto Repair lies adjacent to the southwest property line. Various residential properties border the southeastern side of the site, and L Street and Ninth Street run along the northwest and northeast sides of the property, respectively. The former Crescent Shell site is located within one mile of the Pacific Ocean as shown on Figure 1. A review of county records indicated that there is an ongoing investigation directly to the northeast of the site across L Street.

## **RESULTS OF QUARTERLY SAMPLING**

A groundwater-monitoring program was implemented at the site in May 2002 for wells MW-1 and MW-2, and expanded to MW-4, MW-5, MW-6, and MW-7 on April 22, 2003, following their installation. The current monitoring program will continue until further notice. The program consists of recording monthly water level data and collecting quarterly groundwater samples for laboratory analysis. Water level data is used to develop a figure which displays the groundwater gradient and average flow direction using standard three-point calculations. Analytical results from groundwater samples collected from the monitoring wells during quarterly sampling events present hydrocarbon contamination levels in the groundwater beneath the site. Monitoring wells were gauged and sampled on January 30, 2005.

### **FIELD DATA**

<b>Wells gauged:</b>	MW-1, MW-2, MW-4, MW-5, MW-6, and MW-7
<b>Groundwater:</b>	Ranged from 28.54 to 30.04 feet above mean sea level (Table 1)
<b>Floating product:</b>	Sheen detected in MW-4, MW-5, and MW-6
<b>Groundwater gradient:</b>	0.01 feet per foot
<b>Flow Direction:</b>	ESE

On January 30, 2005, the depth to groundwater in the site's six monitoring wells ranged from 6.76 feet below top of casing (btoc) in well MW-1 to 9.26 feet btoc in MW-6. When corrected to mean sea-level, water level elevations ranged from 28.54 feet above mean sea-level (amsl) in MW-6 to 30.04 feet amsl in MW-7. Groundwater levels for the January 30, 2005 monitoring event, along with historical level and elevations are included in Table 1. Groundwater flow on January 30, 2005 was towards the east-southeast at a gradient of 0.01 feet per foot. This flow direction and gradient are similar to the previous monitoring event's flow direction and gradient. The groundwater flow and gradient are graphically depicted in Figure 3. Prior to sampling, all wells were purged; the groundwater field parameters for each well are presented below.

### **MONITORING WELL MW-1 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
12:56	0	6.91	58.98	0.837
1:00	1.06	6.94	58.93	0.840
1:03	2.12	6.95	59.09	0.859
1:08	3.18	7.02	59.25	0.840

**MONITORING WELL MW-2 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
1:19	0	7.29	58.66	0.303
1:24	0.86	7.14	59.20	0.306
1:27	1.72	7.05	59.27	0.306
1:31	2.58	7.02	59.28	0.301

**MONITORING WELL MW-4 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
1:40	0	7.20	61.32	0.187
1:45	1.82	7.18	61.86	0.184
1:50	3.64	7.17	61.92	0.187
1:54	5.46	7.17	61.88	0.187

**MONITORING WELL MW-5 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
2:03	0	7.21	60.65	0.169
2:08	1.68	7.15	61.65	0.187
2:13	3.36	7.13	61.71	0.184
2:18	5.04	7.14	61.66	0.190

### **MONITORING WELL MW-6 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
2:30	0	7.12	57.80	0.133
2:34	1.51	7.12	58.58	0.156
2:37	3.02	7.10	58.82	0.163
2:42	4.53	7.03	58.92	0.163

### **MONITORING WELL MW-7 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
2:55	0	6.92	56.32	0.153
2:59	1.84	6.96	58.50	0.170
3:06	3.68	6.96	57.92	0.170
3:11	5.52	6.97	58.96	0.175

### **ANALYTICAL RESULTS**

Sampling locations: MW-1, MW-2, MW-4, MW-5, MW-6, and MW-7

Analyses performed: TPHg, BTXE, MTBE, DIPE, TAME, ETBE, TBA, TPHd, TPHmo

Laboratories Used: Basic Labs, Redding, California

The analytical results for the current monitoring event are presented on the attached page and graphically depicted in Figure 4. The laboratory report is included as Appendix A. The historical analytical results for all monitoring wells, since the implementation of groundwater monitoring are included as Table 2.

## Lab Results

	<u>MW-1 ppb</u>	<u>MW-2 ppb</u>	<u>MW-4 ppb</u>	<u>MW-5 ppb</u>	<u>MW-6 ppb</u>	<u>MW-7 ppb</u>
<b>TPHg:</b>	<b>8,040</b>	<b>566</b>	ND < 50	<b>75.4</b>	ND < 50	ND < 50
<b>Benzene:</b>	<b>21.0</b>	<b>0.5</b>	ND < 0.5	<b>9.1</b>	ND < 0.5	ND < 0.5
<b>Toluene:</b>	<b>11.0</b>	ND < 0.5	ND < 0.5	<b>0.6</b>	ND < 0.5	ND < 0.5
<b>Xylenes:</b>	<b>1,940</b>	ND < 1.0	ND < 1.0	<b>6.3</b>	ND < 1.0	ND < 1.0
<b>Ethylbenzene:</b>	<b>1,550</b>	<b>0.5</b>	ND < 0.5	<b>9.1</b>	ND < 0.5	ND < 0.5
<b>MTBE:</b>	ND < 20.0	ND < 1.0	ND < 1.0	ND < 1.0	ND < 1.0	ND < 1.0
<b>DIPE:</b>	ND < 10.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5
<b>TAME:</b>	ND < 100	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0
<b>ETBE:</b>	ND < 100	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0
<b>TBA:</b>	ND < 1,000	ND < 50	ND < 50	ND < 50	ND < 50	ND < 50
<b>TPHd:</b>	<b>3,340</b>	<b>218</b>	ND < 50	ND < 50	ND < 50	ND < 50
<b>TPHmo:</b>	ND < 50	ND < 50	ND < 50	ND < 50	ND < 50	ND < 50

ND = non-detectable

## COMMENTS AND RECOMMENDATIONS

On January 30, the groundwater monitoring event for the three on-site monitoring wells and three off-site monitoring wells was conducted at the Crescent Shell at 890 L Street in Crescent City, California. A summary of the results are presented below.

- The depth to groundwater ranged between 6.76 feet bgs to 9.26 feet bgs. Groundwater flow was towards the East Southeast at a gradient of 0.01 feet per foot.
- Groundwater samples were collected and analyzed for TPHg, TPHd, TPHmo, BTXE, and five-fuel oxygenates. Laboratory results reported TPHg in three of the six wells at concentrations ranging between 75.4 ppb (MW-5) and 8,040 ppb (MW-1). Benzene

was reported in three wells at concentrations ranging between 0.5 ppb (MW-2) and 21 ppb (MW-1). Toluene was reported in two wells at concentrations of 0.6 ppb (MW-5) and 11.0 ppb (MW-1). Xylenes were reported in two wells at concentrations of 6.3 ppb (MW-5) and 1,940 ppb (MW-1). Ethylbenzene was reported in three wells at concentrations ranging between 0.5 ppb (MW-2) and 1,550 ppb (MW-1). TPHd was reported in two wells at concentrations of 218 ppb (MW-2) and 3,340 ppb (MW-1). No TPHmo or fuel oxygenates were reported.

Based upon these results the following observations and conclusions have been made.

- TPHg has consistently been reported in wells MW-1, MW-2, and MW-5. Over time these wells have reported TPHg as random fluctuations. In the remaining wells TPHg at levels slightly above the reporting limit had been reported in each well only once since the introduction of the groundwater monitoring. The historical changes of TPHg in all the wells are shown in Figures 5 through 10.
- TPHd has consistently been reported in wells MW-1 and MW-2 since the inception of the monitoring, except during the first quarter of 2004. In well MW-5, TPHd was reported once during the well installation sampling event. In wells MW-4, MW-6, and MW-7, TPHd was never reported. Changes in the levels of TPHd in the wells are shown in Figures 5, 6 and 8.
- TPHmo was only reported in well MW-1 (822 ppb) in the second quarter of 2002.
- BTXE has never been detected in well MW-4. In wells MW-6 and MW-7, with the exception of a single report of ethylbenzene, just above the reporting limit, during the tenth quarterly monitoring event, BTXE compounds have never been reported. The changes in the levels of BTXE in the wells are shown in Figures 5, 6 and 8.

- Benzene has been detected in wells MW-2 and MW-5 consistently since the inception of the monitoring. Benzene was detected in well MW-1 in five of the last twelve sampling events. .
- Toluene was detected in MW-1 in six of the last twelve sampling events. Toluene was detected in MW-2 in five of the twelve sampling events and in MW-5 during four of the last eight sampling events.
- Xylenes were consistently detected in MW-1 during eleven of the twelve sampling events. Xylenes were detected in MW-2 in six of the twelve sampling events and were consistently detected in MW-5 except during the first quarter 2004 when the non-detect levels were reported.
- Ethylbenzene was detected in wells MW-1, MW-2, and MW-5 consistently since the inception of the monitoring. Ethylbenzene was detected once in wells MW-6 and MW-7 for the first time (Fourth Quarter 2004) since the inception of the monitoring; at levels slightly higher than the reporting limits.
- MTBE was reported once in well MW-1 (349 ppb) during the fourth quarter 2002 and once in well MW-4 (0.7 ppb) during the well installation sampling event. It has never been reported at any other time.



Based on the results of the January monitoring event and historical results, the following future activities are proposed.

- Groundwater monitoring will be continued until further notice. Groundwater level measurements will be collected from the three on-site and the three off-site monitoring wells to determine groundwater flow direction and gradient. Collected groundwater samples will be analyzed for TPHg, TPHd, TPHmo, BTXE, and five-fuel oxygenates/additives.
- SounPacific conducted further subsurface investigation at the site during early March 2005. The findings of the investigation will be presented in a separate report.

## CERTIFICATION

This report was prepared under the direct supervision of a California registered geologist at SounPacific. All information provided in this report including statements, conclusions and recommendations are based solely upon field observations and analyses performed by a state-certified laboratory. SounPacific is not responsible for laboratory errors.

SounPacific promises to perform all its work in a manner that is currently used by members in similar professions working in the same geographic area. SounPacific will do whatever is reasonable to ensure that data collection is accurate. Please note however, that rain, buried utilities, and other factors can influence groundwater depths, directions and other factors beyond what SounPacific could reasonably determine.

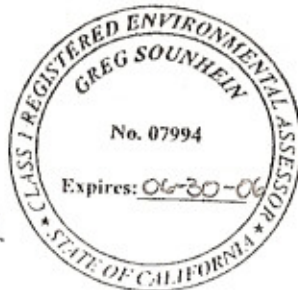
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## **ATTACHMENTS**

### **TABLES & CHARTS**

- Table 1: Monthly Water Levels  
Table 2: Groundwater Analytical Results  
Chart 1: Monthly Hydrograph

### **FIGURES**

- Figure 1: Aerial/Topo Map  
Figure 2: Site Plan  
Figure 3: Groundwater Gradient Map January 2005  
Figure 4: Groundwater Analytical Results  
Figure 5: MW-1 Hydrocarbon Concentrations vs. Time  
Figure 6: MW-2 Hydrocarbon Concentrations vs. Time  
Figure 7: MW-4 Hydrocarbon Concentrations vs. Time  
Figure 8: MW-5 Hydrocarbon Concentrations vs. Time  
Figure 9: MW-6 Hydrocarbon Concentrations vs. Time  
Figure 10: MW-7 Hydrocarbon Concentrations vs. Time

### **APPENDICES**

- Appendix A: Laboratory Report and Chain-of-Custody Form  
Appendix B: Standard Operating Procedures  
Appendix C: Field Notes

# Tables & Chart

**Table 1**  
**Water Levels**

Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Date	Depth to Bottom/ Feet BGS	Survey Height/ Feet Above MSL	Depth to Water/ Feet BGS	Adjusted Elevation/ Feet Above MSL	Thickness of Floating Product/ Feet	Corrected Adjusted Elevation/ feet Above MSL
MW-1	5/6/2002	13.41	36.78	7.70	29.08	----	----
	8/4/2002	13.44	36.78	9.88	26.90	----	----
	11/6/2002	13.42	36.78	11.69	25.09	----	----
	2/7/2003	13.47	36.78	3.97	32.81	----	----
	4/22/2003	13.65	36.78	3.82	32.96	----	----
	5/22/2003	13.65	36.78	5.64	31.14	SHEEN	----
	6/26/2003	13.65	36.78	8.01	28.77	0.01	28.77
	7/22/2003	13.65	36.78	9.00	27.78	0.00	27.78
	8/25/2003	13.65	36.78	9.92	26.86	0.00	26.86
	9/22/2003	13.65	36.78	10.51	26.27	0.00	26.27
	10/23/2003	13.65	36.78	11.11	25.67	0.00	25.67
	11/25/2003	13.65	36.78	10.63	26.15	0.00	26.15
	12/16/2003	13.65	36.78	7.41	29.37	0.00	29.37
	1/23/2004	13.65	36.78	4.41	32.37	0.00	32.37
	2/24/2004	13.65	36.78	2.60	34.18	0.00	34.18
	3/26/2004	13.65	36.78	4.51	32.27	0.00	32.27
	4/29/2004	13.65	36.78	5.75	31.03	0.00	31.03
	7/30/2004	13.68	36.78	9.94	26.84	0.00	26.84
	11/2/2004	13.67	36.78	10.39	26.39	0.00	26.39
	1/30/2005	13.40	36.78	6.76	30.02	0.00	30.02
MW-2	5/6/2002	13.48	37.20	9.25	27.95	----	----
	8/4/2002	13.49	37.20	11.24	25.96	----	----
	11/6/2002	13.50	37.20	12.90	24.30	----	----
	2/7/2003	13.52	37.20	6.38	30.82	----	----
	4/22/2003	13.41	37.20	6.33	30.87	----	----
	5/22/2003	13.41	37.20	7.74	29.46	0.00	29.46
	6/26/2003	13.41	37.20	9.58	27.62	0.00	27.62
	7/22/2003	13.41	37.20	10.43	26.77	0.00	26.77
	8/25/2003	13.41	37.20	11.26	25.94	0.00	25.94
	9/22/2003	13.41	37.20	11.8	25.40	0.00	25.4
	10/23/2003	13.41	37.20	12.35	24.85	0.00	24.85
	11/25/2003	13.41	36.78	12.83	23.95	0.00	23.95
	12/16/2003	13.41	36.78	7.89	28.89	0.00	28.89
	1/23/2004	13.41	37.20	6.69	30.51	0.00	30.51
	2/24/2004	13.41	37.20	4.37	32.83	0.00	32.83
	3/26/2004	13.41	37.20	6.33	30.87	0.00	30.87
	4/29/2004	13.41	37.20	7.65	29.55	0.00	29.55
	7/30/2004	13.74	37.20	11.27	25.93	0.00	25.93
	11/2/2004	13.43	37.20	11.55	25.65	0.00	25.65
	1/30/2005	13.75	37.20	8.37	28.83	0.00	28.83
MW-4	4/22/2003	18.92	36.86	5.20	31.66	----	----
	5/22/2003	18.91	36.86	6.74	30.12	0.01	30.13
	6/26/2003	18.92	36.86	9.64	27.22	0.01	27.23
	7/22/2003	18.92	36.86	9.51	27.35	0.01	27.36
	8/25/2003	18.92	36.86	10.38	26.48	0.01	26.49
	9/22/2003	18.92	36.86	10.94	25.92	0.00	25.92
	10/23/2003	18.92	36.86	11.52	25.34	0.00	25.34
	11/25/2003	18.92	36.78	11.04	25.74	0.00	25.74
	12/16/2003	18.92	36.78	8.05	28.73	0.00	28.73
	1/23/2004	18.92	36.86	5.65	31.21	0.00	31.21
	2/24/2004	18.92	36.86	3.82	33.04	0.00	33.04
	3/26/2004	18.92	36.86	5.79	31.07	0.00	31.07
	4/29/2004	18.92	36.86	6.79	30.07	0.00	30.07
	7/30/2004	18.91	36.86	10.43	26.43	0.00	26.43
	11/2/2004	18.91	36.86	10.83	26.03	0.00	26.03
	1/30/2005	18.91	36.86	7.54	29.32	0.00	29.32

Corrected Adjusted Elevation =  
Adjusted Groundwater Elevation + ( Thickness of product x (density of product/density of w  
Density of product = 0.73 g/mL (density of oil)  
Density of water = 1g/mL

**Table 1 (cont.)**  
**Water Levels**  
Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Date	Depth to Bottom/ Feet BGS	Survey Height/ Feet Above MSL	Depth to Water/ Feet BGS	Adjusted Elevation/ Feet Above MSL	Thickness of Floating Product/ Feet	Corrected Adjusted Elevation/ feet Above MSL
MW-5	4/22/2003	18.83	37.27	6.17	31.10	----	----
	5/22/2003	18.87	37.27	7.60	29.67	0.01	29.68
	6/26/2003	18.83	37.27	9.46	27.81	SHEEN	----
	7/22/2003	18.83	37.27	10.31	26.96	SHEEN	----
	8/25/2003	18.83	37.27	11.17	26.10	0.00	26.10
	9/22/2003	18.83	37.27	11.71	25.56	0.00	25.56
	10/23/2003	18.83	37.27	12.26	25.01	0.00	25.01
	11/25/2003	18.83	36.78	12.77	24.01	0.00	24.01
	12/16/2003	18.83	36.78	8.09	28.69	0.00	28.69
	1/23/2004	18.83	37.27	6.53	30.74	0.00	30.74
	2/24/2004	18.83	37.27	4.39	32.88	0.00	32.88
	3/26/2004	18.83	37.27	6.41	30.86	0.00	30.86
	4/29/2004	18.83	37.27	7.55	29.72	0.00	29.72
	7/30/2004	18.81	37.27	11.18	26.09	0.00	26.09
	11/2/2004	18.86	37.27	11.48	25.79	0.00	25.79
	1/30/2005	18.79	37.27	8.26	29.01	0.00	29.01
MW-6	4/22/2003	18.74	37.80	7.35	30.45	----	----
	5/22/2003	18.69	37.80	8.73	29.07	SHEEN	----
	6/26/2003	18.74	37.80	10.48	27.32	0.00	27.32
	7/22/2003	18.74	37.80	11.31	26.49	0.00	26.5
	8/25/2003	18.74	37.80	12.13	25.67	0.00	25.67
	9/22/2003	18.74	37.80	12.67	25.13	0.00	25.13
	10/23/2003	18.74	37.80	13.18	24.62	0.00	24.62
	11/25/2003	18.74	36.78	12.66	24.12	0.00	24.12
	12/16/2003	18.74	36.78	8.42	28.36	0.00	28.36
	1/23/2004	18.74	37.80	7.71	30.09	0.00	30.09
	2/24/2004	18.74	37.80	5.24	32.56	0.00	32.56
	3/26/2004	18.74	37.80	7.15	30.65	0.00	30.65
	4/29/2004	18.74	37.80	8.60	29.20	0.00	29.20
	7/30/2004	18.69	37.80	12.14	25.66	0.00	25.66
	11/2/2004	18.63	37.80	12.37	25.43	0.00	25.43
	1/30/2005	18.70	37.80	9.26	28.54	0.00	28.54
MW-7	4/22/2003	18.31	36.88	4.3	32.57	----	----
	5/22/2003	18.30	36.88	5.95	30.93	0.00	30.93
	6/26/2003	18.31	36.88	8.29	28.59	0.00	28.59
	7/22/2003	18.31	36.88	9.29	27.59	0.00	27.59
	8/25/2003	18.31	36.88	10.23	26.65	0.00	26.65
	9/22/2003	18.31	36.88	10.81	26.07	0.00	26.07
	10/23/2003	18.31	36.88	11.38	25.50	0.00	25.50
	11/25/2003	18.31	36.78	10.84	25.94	0.00	25.94
	12/16/2003	18.31	36.78	6.75	30.03	0.00	30.03
	1/23/2004	18.31	36.88	4.80	32.08	0.00	32.08
	2/24/2004	18.31	36.88	2.65	34.23	0.00	34.23
	3/26/2004	18.31	36.88	4.59	32.29	0.00	32.29
	4/29/2004	18.31	36.88	5.93	30.95	0.00	30.95
	7/30/2004	18.30	36.88	10.21	26.67	0.00	26.67
	11/2/2004	18.22	36.88	10.53	26.35	0.00	26.35
	1/30/2005	18.31	36.88	6.84	30.04	0.00	30.04

Corrected Adjusted Elevation =  
Density of product = 0.73 g/mL (density of oil)  
Density of water = 1g/mL

**Table 2**  
**Groundwater Analytical Results**  
 Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Sample Location	Annual Event	Sample Event	Sample Date	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	Ethylbenzene (ppb)	MTBE (ppb)	DIPE (ppb)	TAME (ppb)	ETBE (ppb)	TBA (ppb)	TPHd (ppb)	TPHmo (ppb)
MW-1	Second Quarter	First Quarterly	5/5/2002	52,800	ND < 300	ND < 300	ND < 300	3,730	ND < 300	ND < 500	ND < 500	ND < 500	ND < 100,000	3,180	822
	Third Quarter	Second Quarterly	8/3/2002	10,400	ND < 60	ND < 60	859	5,000	ND < 400	ND < 100	ND < 100	ND < 100	ND < 20,000	4,670	ND < 50
	Fourth Quarter	Third Quarterly	11/6/2002	6,030	ND < 60	103	313	4,370	349	ND < 100	ND < 100	ND < 100	ND < 20,000	2,080	ND < 50
	First Quarter	Fourth Quarterly	2/7/2003	14,000	32	37	212	2,200	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	1,800	ND < 500
	Second Quarter	Well Installation	4/22/2003	13,000	ND < 50	ND < 50	190	1,900	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,000	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	920	11	40	266	1,100	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50	6,800	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	21,000	18	51	235	6,100	ND < 10	ND < 10	ND < 10	ND < 10	ND < 100	4,900	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	7,600	73	ND < 50	130	1,800	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	16,000	ND < 50	ND < 50	91	2,000	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,400	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	13,000	ND < 50	ND < 50	110	3,700	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	6,200	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	14,000	ND < 50	76	304	4,200	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,100	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	8,040	21.0	11.0	1,940	1,550	ND < 20.0	ND < 10.0	ND < 100	ND < 100	ND < 1,000	3,340	ND < 50
MW-2	Second Quarter	First Quarterly	5/5/2002	1,440	5.1	ND < 0.3	2.6	54	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	380	ND < 50
	Third Quarter	Second Quarterly	8/3/2002	1,280	96.6	4.4	11.8	433	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	1,300	ND < 50
	Fourth Quarter	Third Quarterly	11/6/2002	479	75.1	4.1	15	237	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	379	ND < 50
	First Quarter	Fourth Quarterly	2/7/2003	470	2.2	ND < 0.5	ND < 1	0.6	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	90	ND < 500
	Second Quarter	Well Installation	4/22/2003	740	2.0	ND < 0.5	ND < 1	5.7	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	270	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	2,000	11	1.8	10	120	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	530	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	3,100	180	7.8	22	770	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50	1,000	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	150	1.0	ND < 0.5	ND < 1	1.2	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	1,400	1.1	ND < 0.5	ND < 1	8.2	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	300	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	2,100	6.7	2.5	6.2	240	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	890	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	2,000	12	ND < 5	ND < 15	720	ND < 0.5	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50.0	560	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	566	0.5	ND < 0.5	ND < 1.0	0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50.0	218	ND < 50
MW-4	Second Quarter	Well Installation	4/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	0.7	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	78	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50

Notes:

TPHg: Total petroleum hydrocarbons as gasoline  
 TPHd: Total petroleum hydrocarbons as diesel  
 TPHmo: Total Petroleum hydrocarbons as motor oil  
 MTBE: Methyl tertiary butyl ether  
 TAME: Tertiary amyl methyl ether

TBA: Tertiary butanol  
 DIPE: Diisopropyl ether  
 ETBE: Ethyl tertiary butyl ether  
 ppb: parts per billion = µg/l = 1,000 mg/l = 0.001 ppm.  
 ND: Not detected at or above the method detection limit as shown.

**Table 2 (cont.)**  
**Groundwater Analytical Results**

Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Annual Event	Sample Event	Sample Date	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	Ethylbenzene (ppb)	MTBE (ppb)	DIPE (ppb)	TAME (ppb)	ETBE (ppb)	TBA (ppb)	TPHd (ppb)	TPHmo (ppb)
MW-5	Second Quarter	Well Installation	4/22/2003	<b>4,800</b>	<b>98</b>	<b>20</b>	<b>530</b>	<b>86</b>	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50	<b>1,500</b>	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	<b>130</b>	<b>5.3</b>	ND < 0.5	<b>4.4</b>	<b>7.2</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	<b>130</b>	<b>22</b>	ND < 0.5	<b>2.6</b>	<b>13</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	<b>170</b>	<b>3.9</b>	ND < 0.5	ND < 0.5	<b>3.2</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	<b>270</b>	<b>34</b>	<b>1.4</b>	<b>32.7</b>	<b>15</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	<b>73</b>	<b>11</b>	ND < 0.5	<b>2.2</b>	<b>11</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	<b>140</b>	<b>26</b>	<b>0.5</b>	<b>13.0</b>	<b>25</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	<b>75.4</b>	<b>9.1</b>	<b>0.6</b>	<b>6.3</b>	<b>9.1</b>	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
MW-6	Second Quarter	Well Installation	4/22/2003	<b>82</b>	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	<b>0.7</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
MW-7	Second Quarter	Well Installation	4/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	<b>75</b>	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	<b>0.5</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50

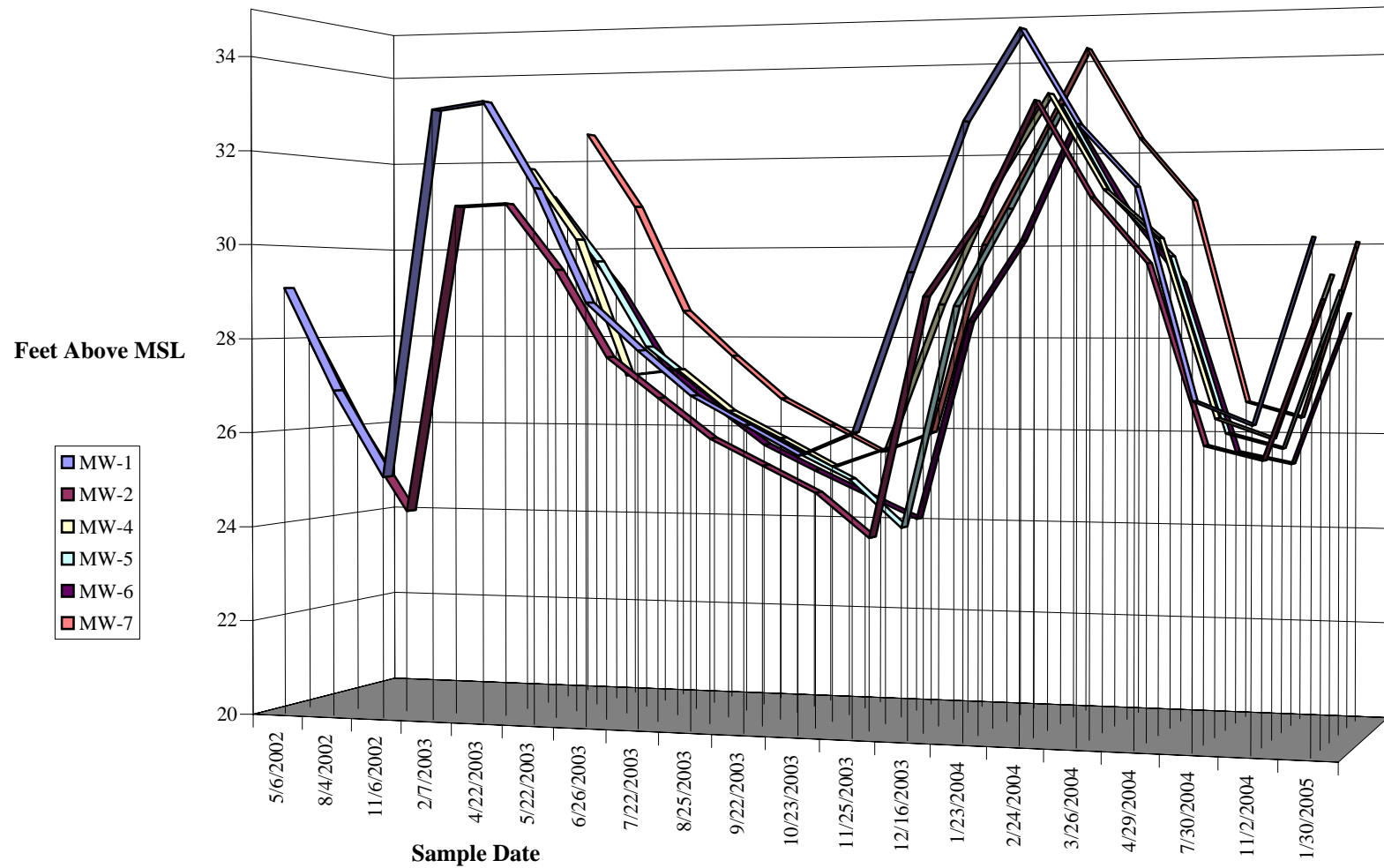
Notes:

TPHg: Total petroleum hydrocarbons as gasoline  
TPHd: Total petroleum hydrocarbons as diesel  
TPHmo: Total Petroleum hydrocarbons as motor oil  
MTBE: Methyl tertiary butyl ether  
TAME: Tertiary amyl methyl ether

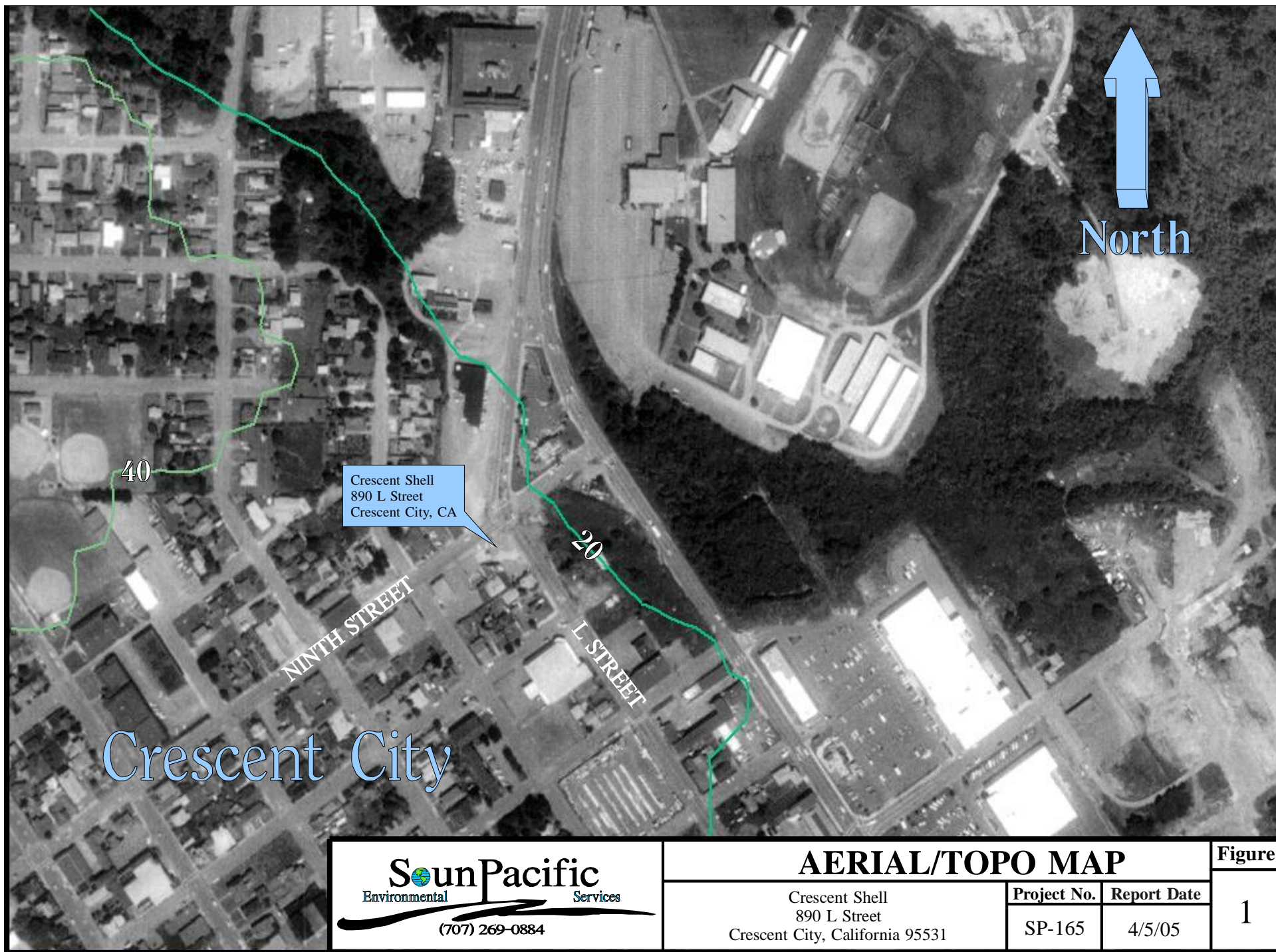
TBA: Tertiary butanol  
DIPE: Diisopropyl ether  
ETBE: Ethyl tertiary butyl ether  
ppb: parts per billion = µg/l = 1,000 mg/l = 0.001 ppm.  
ND: Not detected at or above the method detection limit as shown.




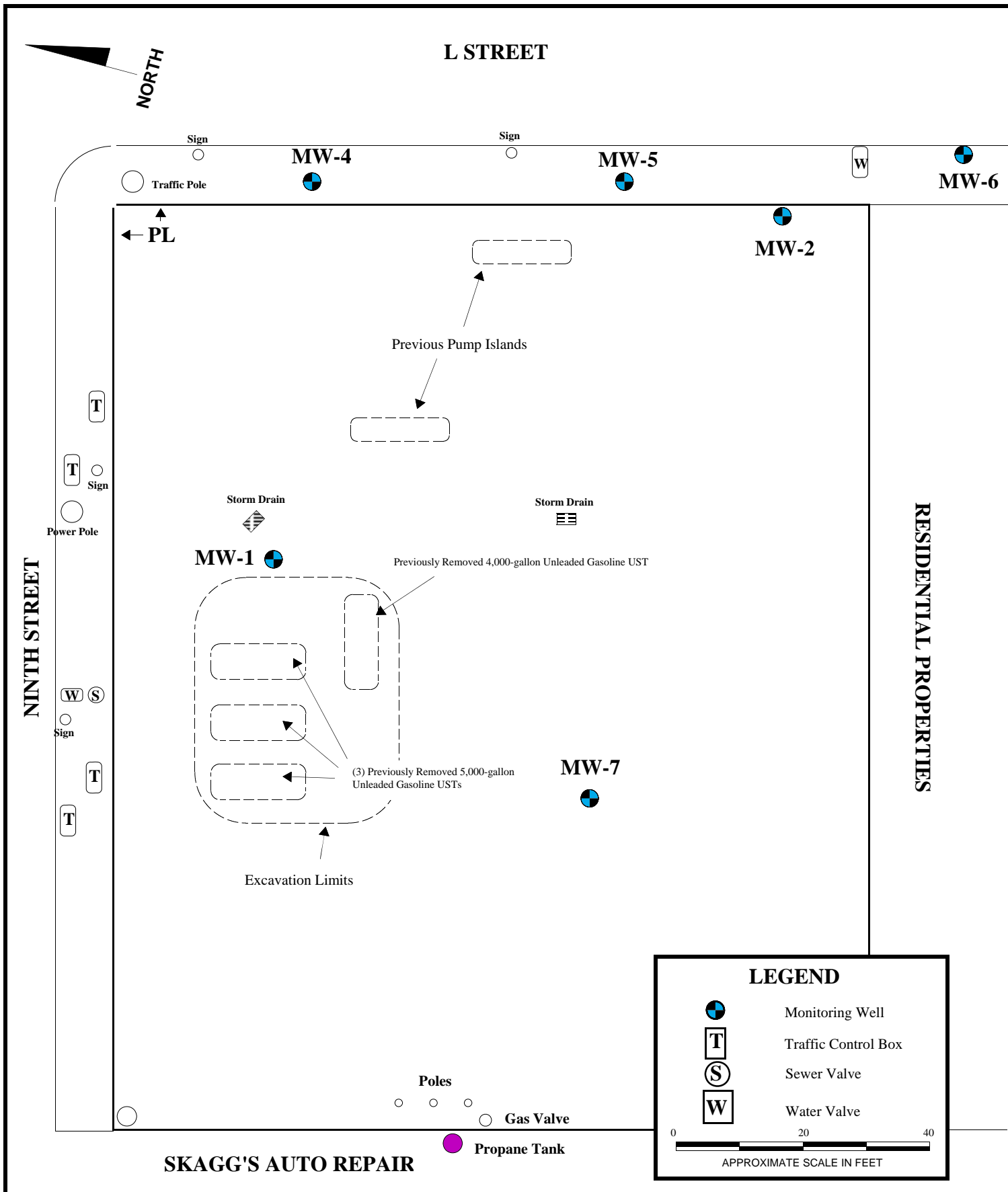
**Chart 1**  
**Monthly Hydrograph**  
Crescent Shell  
890 L Street  
Crescent City, California 95531



# Figures



<div><p><b>Soun Pacific</b> Environmental Services (707) 269-0884</p></div>	<b>AERIAL/TOPO MAP</b>			<b>Figure</b>
	Crescent Shell 890 L Street Crescent City, California 95531	<b>Project No.</b>	<b>Report Date</b>	1
		SP-165	4/5/05	



SKAGG'S AUTO REPAIR

### LEGEND



Monitoring Well



Traffic Control Box



Sewer Valve



Water Valve

0 20 40

APPROXIMATE SCALE IN FEET



## SITE PLAN

Figure

Crescent Shell  
890 L Street  
Crescent City, California 95531

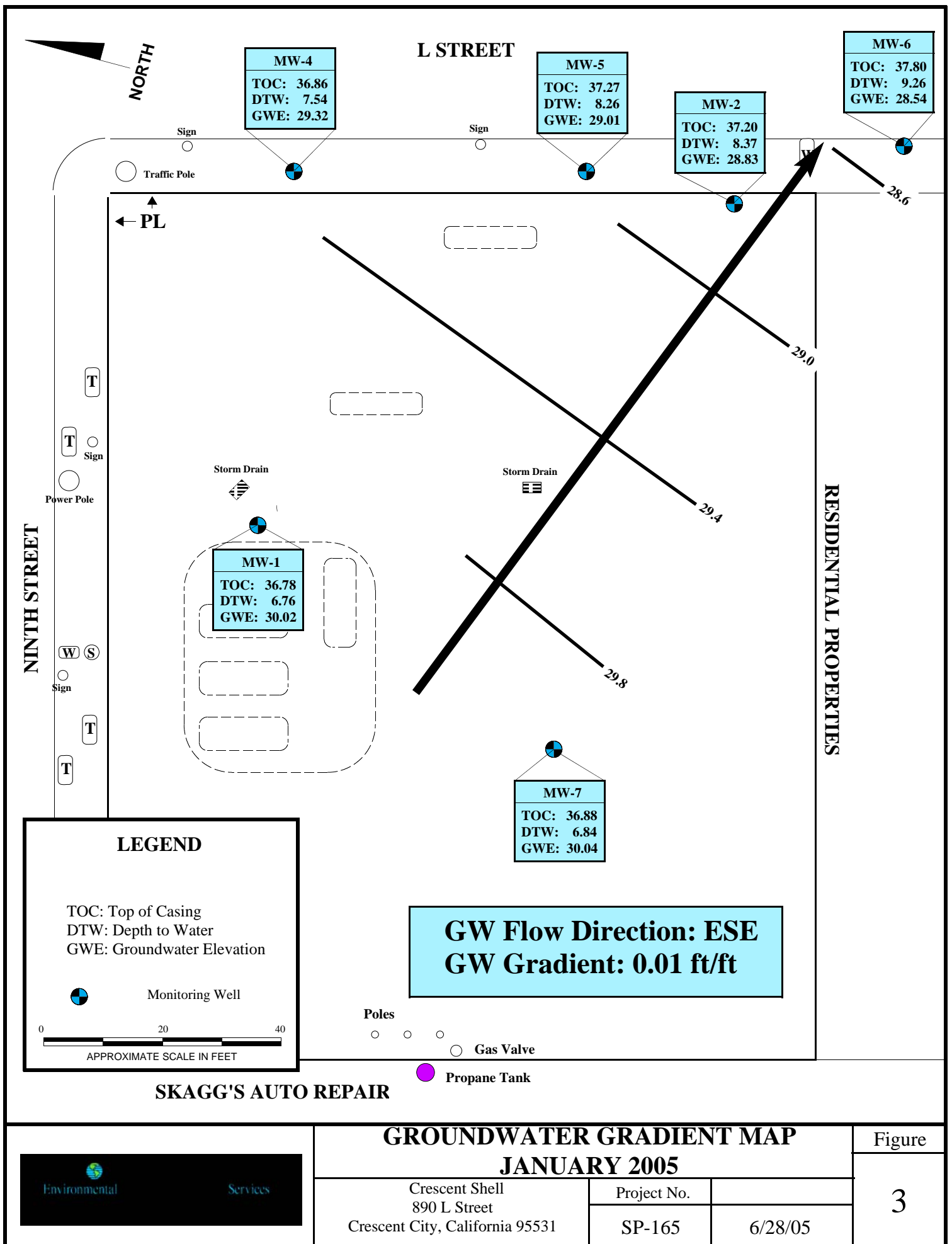
Project No.

SP-165

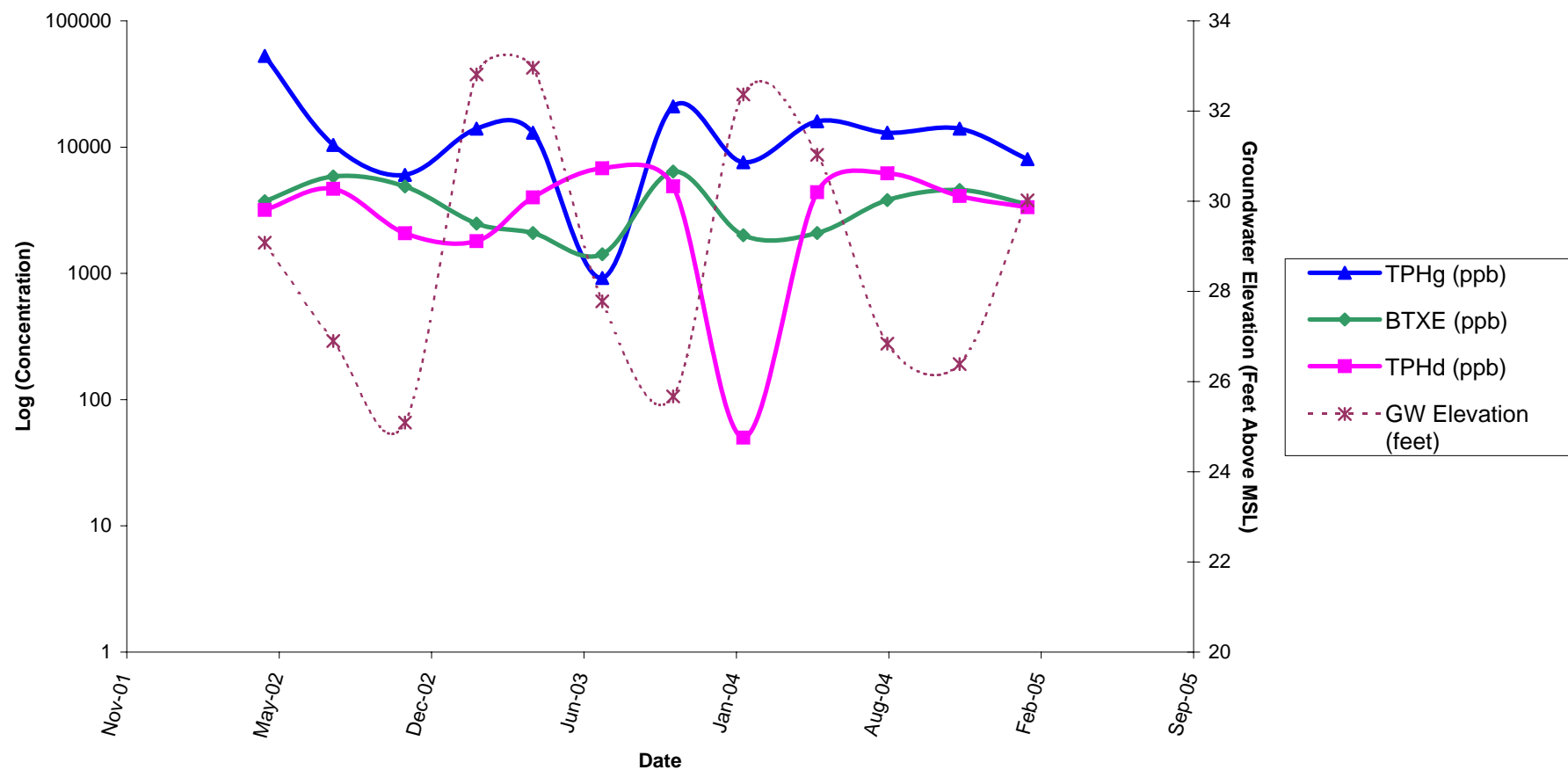
Report Date

6/28/05

2







### MW-1 HYDROCARBON CONCENTRATIONS VS. TIME

Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.

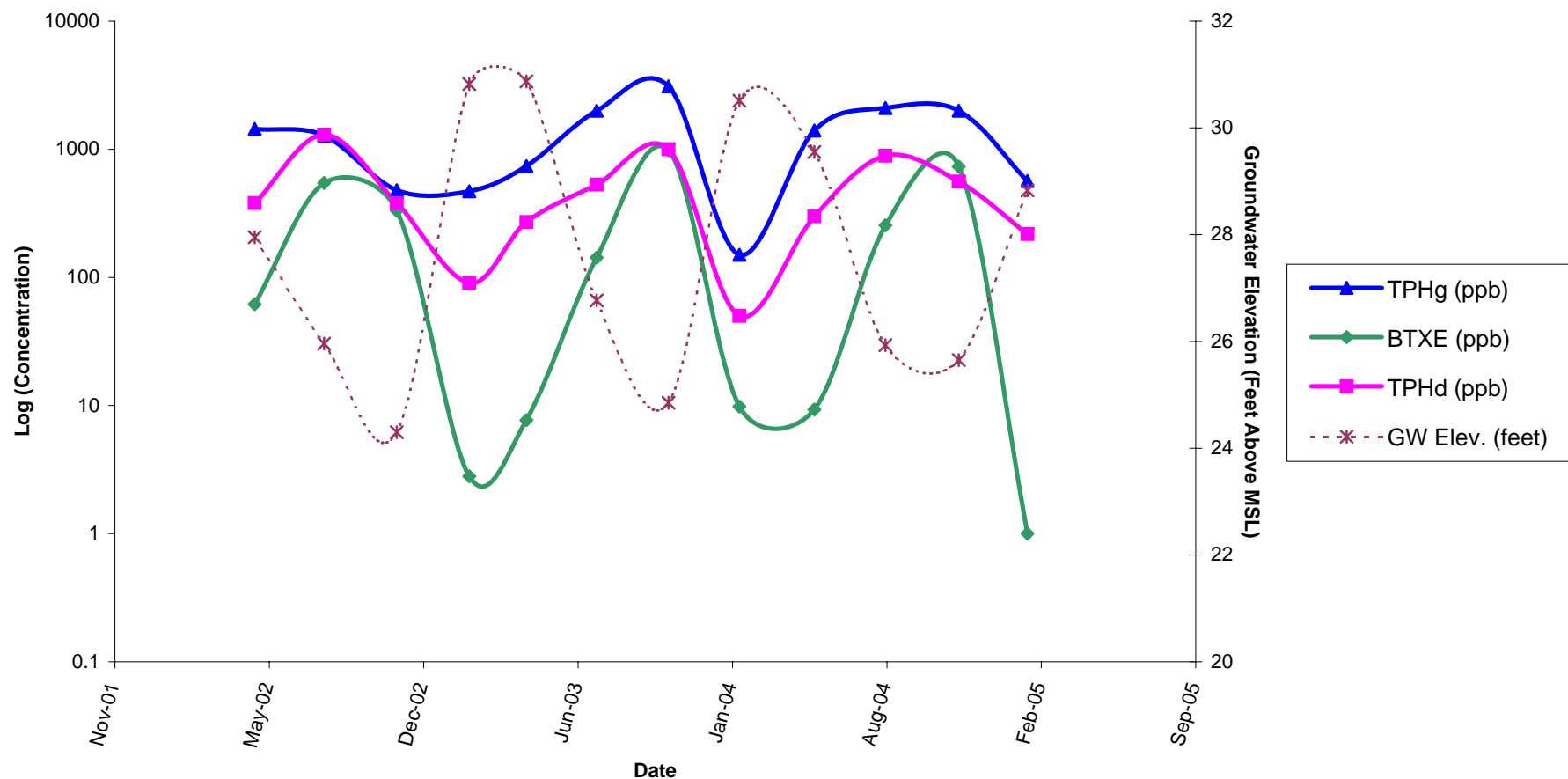
SP-165

Date

4/5/2005

Figure

5



**MW-2 HYDROCARBON  
 CONCENTRATIONS VS. TIME**

Crescent Shell  
 890 L Street  
 Crescent City, California 95531

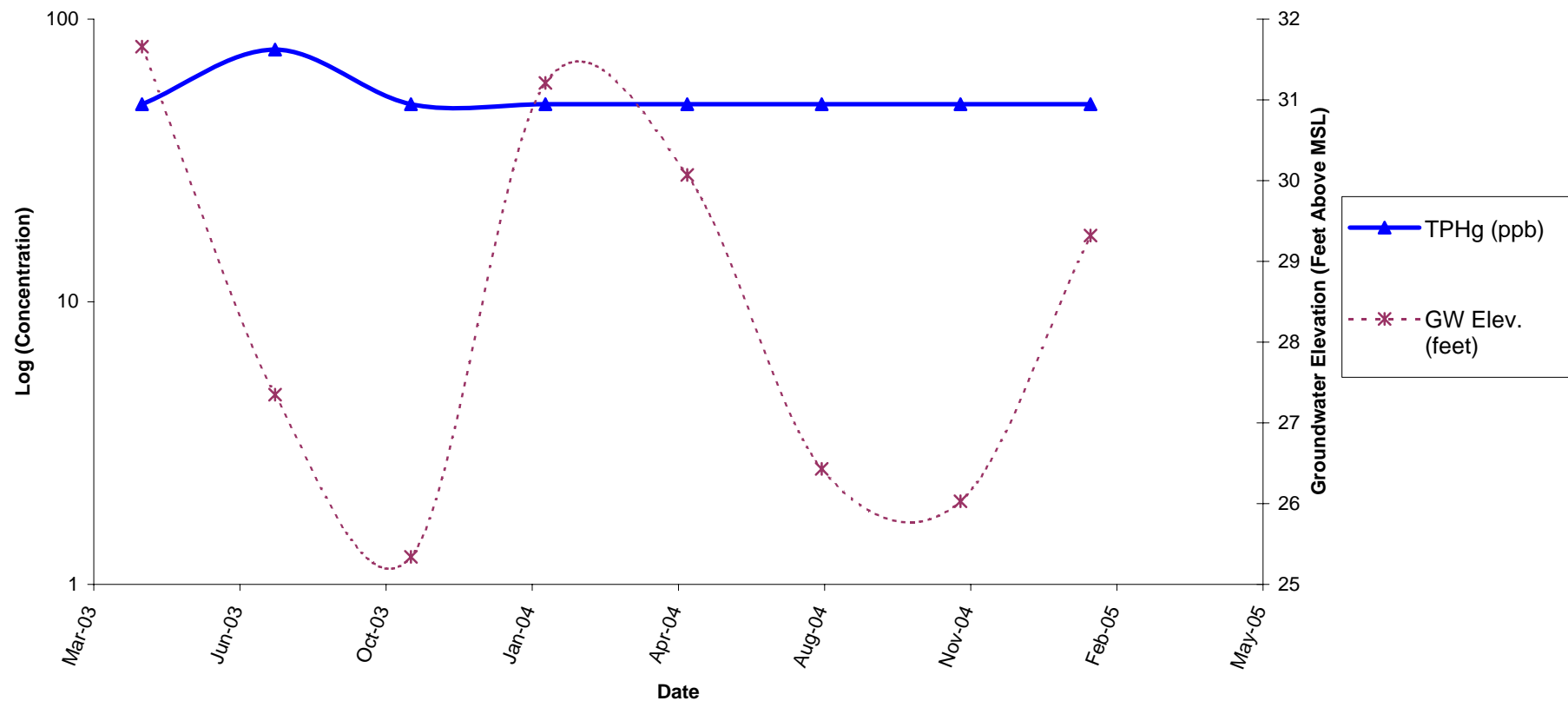
Project No.  
 SP-165

Date  
 4/5/2005

Figure

6





**SounPacific**  
 Environmental Services  
 (707) 269-0884

### MW-4 HYDROCARBON CONCENTRATIONS VS. TIME

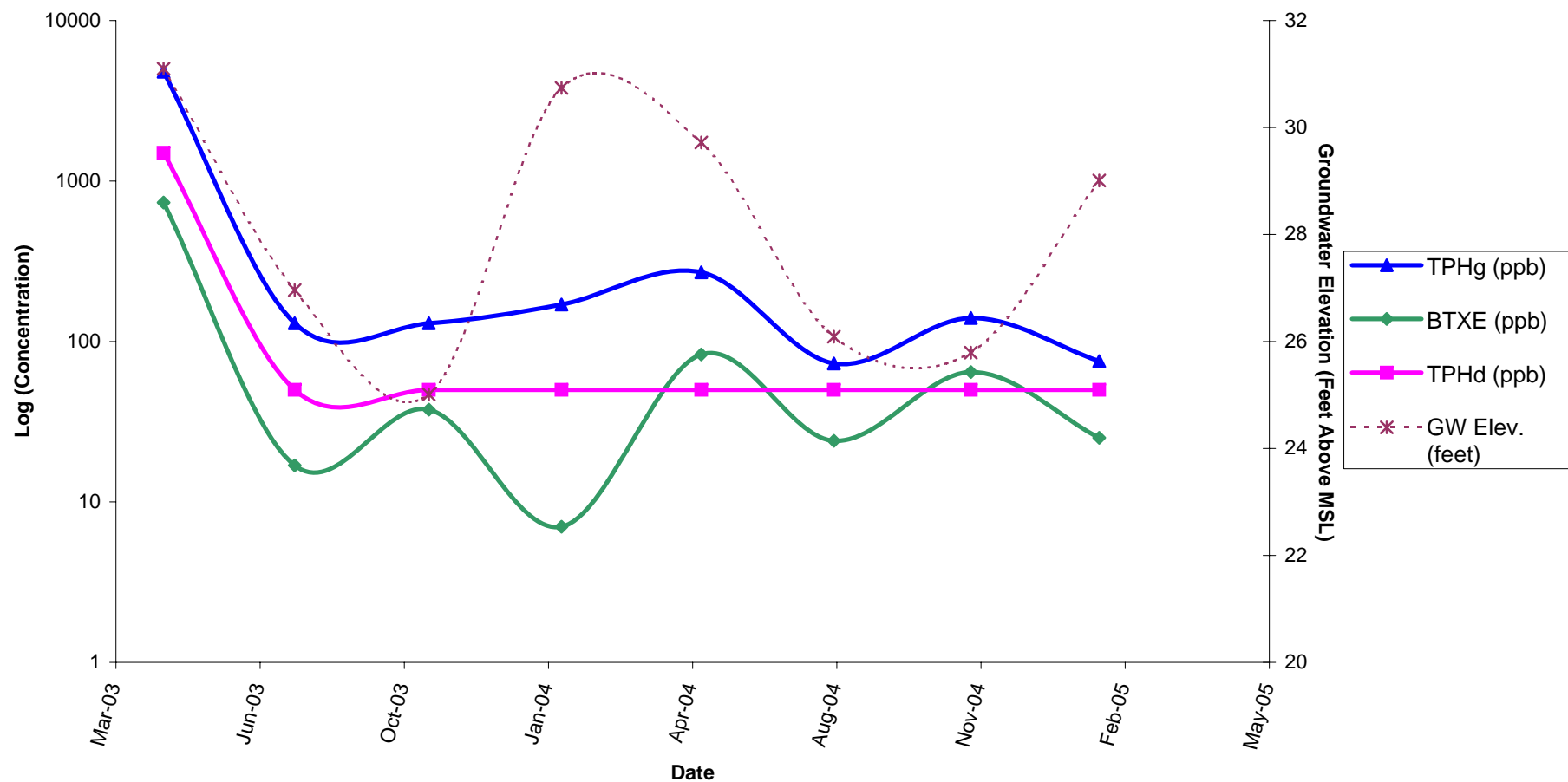
Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.  
 SP-165

Date  
 4/5/2005

Figure

7



**MW-5 HYDROCARBON  
 CONCENTRATIONS VS. TIME**

Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.

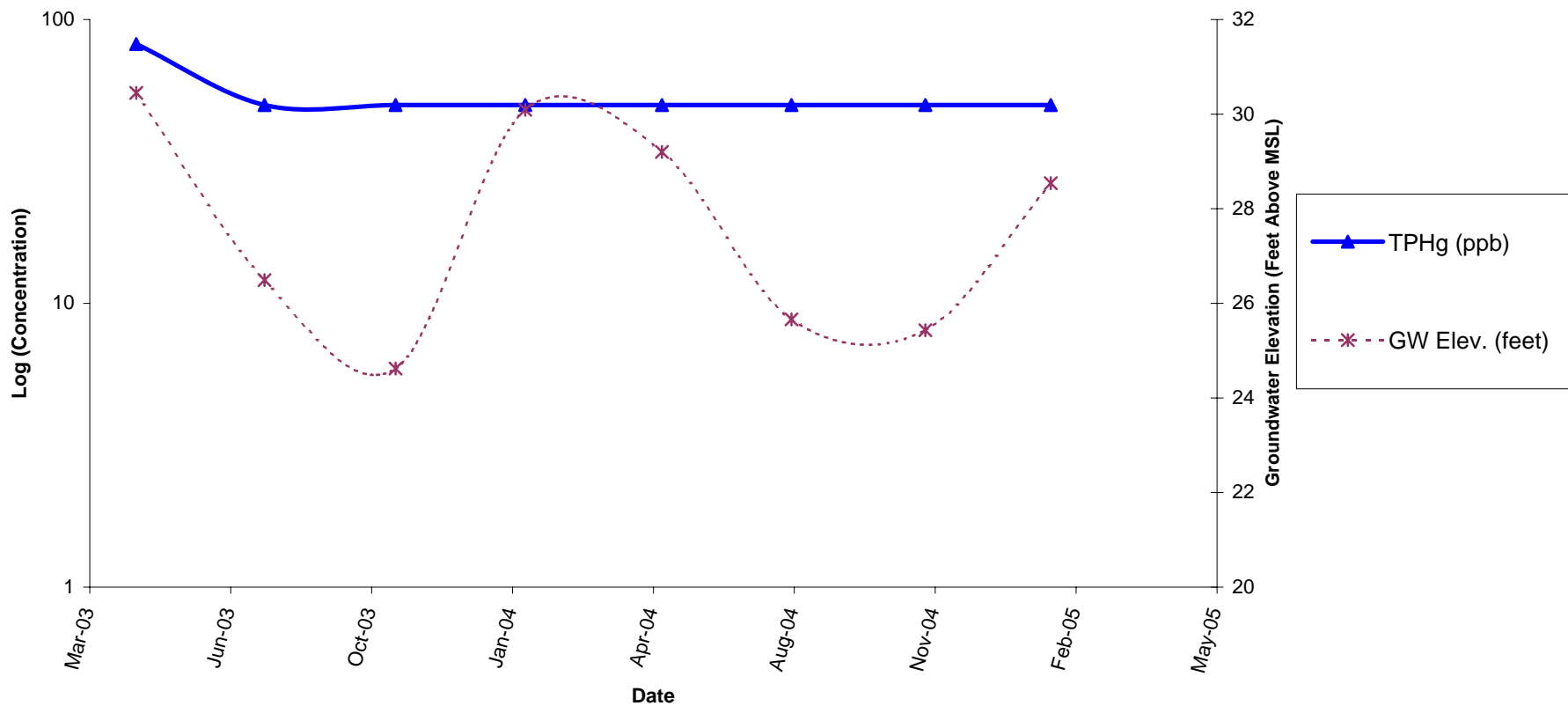
SP-165

Date

4/5/2005

Figure

8



### MW-6 HYDROCARBON CONCENTRATIONS VS. TIME

Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.

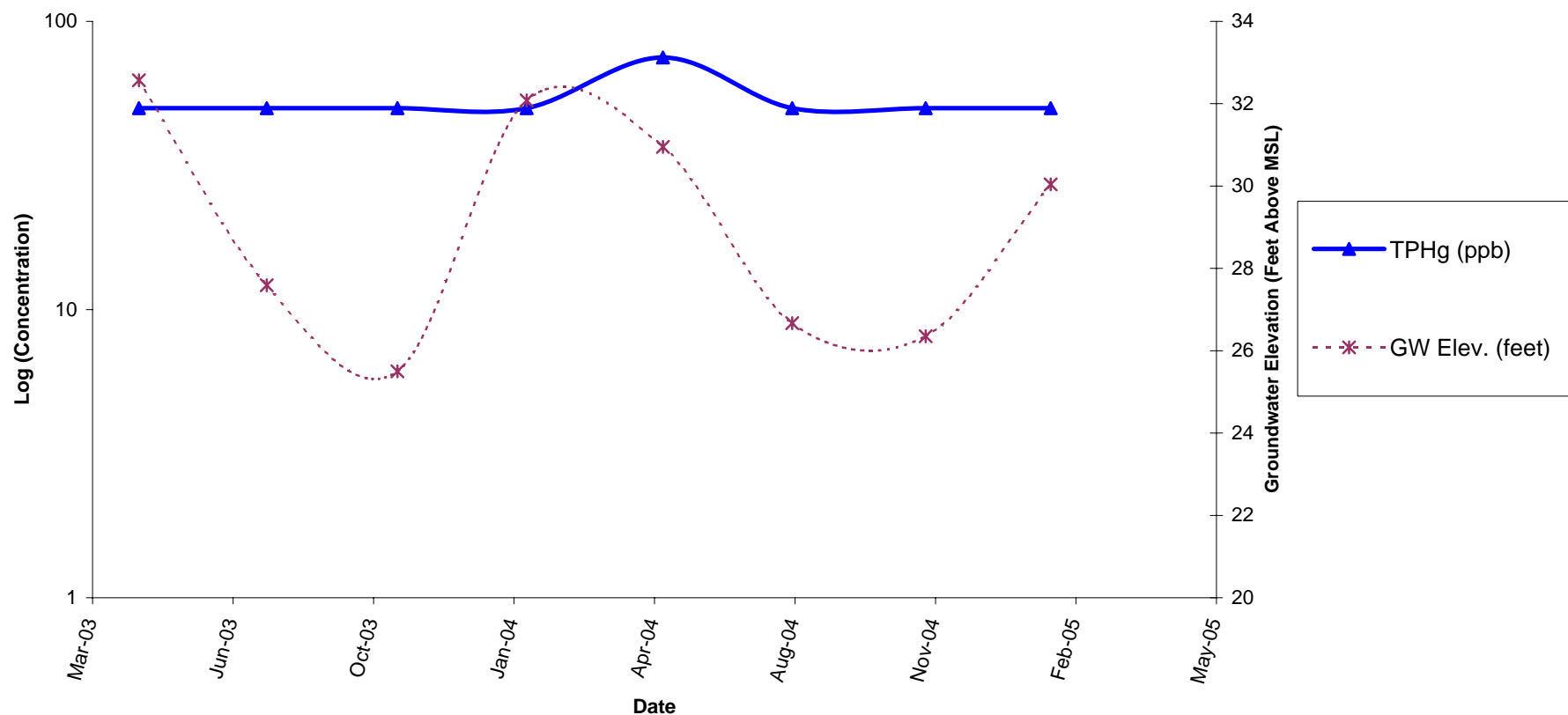
SP-165

Date

4/5/2005

Figure

9



### MW-7 HYDROCARBON CONCENTRATIONS VS. TIME

Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.  
 SP-165

Date  
 4/5/2005

Figure

10

# Appendices

# **Appendix A**

February 21, 2005

**Lab ID: 5020154**

ANDY MALONE  
SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549  
RE: CRESCENT SHELL SP-165

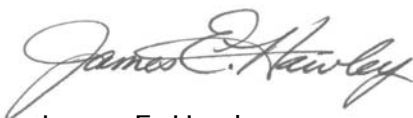
Dear ANDY MALONE,

Enclosed are the analysis results for Work Order number 5020154. All analysis were performed under strict adherence to our established Quality Assurance Plan. Any abnormalities are listed in the qualifier section of this report.

If you have any questions regarding these results, please feel free to contact us at any time. We appreciate the opportunity to service your environmental testing needs.

Sincerely,

For

A handwritten signature in cursive script, reading "James E. Hawley".

James E. Hawley  
Laboratory Director

California ELAP Certification Number 1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549  
Attention: ANDY MALONE  
Project: CRESCENT SHELL SP-165

Lab No: 5020154  
Reported: 02/21/05  
Phone: 707-269-0884  
P.O. #

Description: MW-1  
Matrix: Water  
Lab ID: 5020154-01

Sampled: 01/30/05 00:00  
Received: 02/03/05 10:51

TPH Gasoline

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	8040			1000	EPA 8015/8260	02/07/05	02/07/05	B5B0143
Benzene	"	21.0			10.0	"	"	"	"
Ethylbenzene	"	1550			10.0	"	"	"	"
Toluene	"	11.0			10.0	"	"	"	"
Xylenes (total)	"	1940			20.0	"	"	"	"
Methyl tert-butyl ether	"	ND			20.0	"	"	"	"
Di-isopropyl ether	"	ND			10.0	"	"	"	"
Tert-amyl methyl ether	"	ND			100	"	"	"	"
Ethyl tert-butyl ether	"	ND			100	"	"	"	"
Tert-butyl alcohol	"	ND			1000	"	"	"	"
Surrogate: 4-Bromofluorobenzene		103 %			43-155	"	"	"	"

TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	3340	D-01, D-02		50	EPA 8015 MOD	02/17/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
Surrogate: Octacosane		95.8 %			50-150	"	"	"	"



**Attention:** ANDY MALONE  
**Project:** CRESCENT SHELL SP-165

**Matrix:** Water

**Reported:** 02/21/05

**Phone:** 707-269-0884

**P.O. #**

**Lab ID:** 5020154-02

**Sampled:** 01/30/05 00:00

Received: 02/03/05 10:51

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Gasoline	ug/l	566			50.0	EPA 8015/8260	02/07/05	02/07/05	B5B0143
Benzene	"	0.5			0.5	"	"	"	"
Ethylbenzene	"	0.5			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
Surrogate: 4-Bromofluorobenzene		103 %			43-155	"	"	"	"

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Diesel	ug/l	218	D-01, D-02		50	EPA 8015 MOD	02/17/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
Surrogate: Octacosane		95.4 %		50-150		"	"	"	"

Basic Laboratory, Inc.

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

**Attention:** ANDY MALONE

**Project:** CRESCENT SHELL SP-165

**Description:** MW-4

**Matrix:** Water

**Lab ID:** 5020154-03

**Lab No:** 5020154  
**Reported:** 02/21/05  
**Phone:** 707-269-0884  
**P.O. #**

**Sampled:** 01/30/05 00:00

**Received:** 02/03/05 10:51

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## TPH Gasoline

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Gasoline	ug/l	ND			50.0	EPA 8015/8260	02/05/05	02/04/05	B5B0143
Benzene	"	ND			0.5	"	"	"	"
Ethylbenzene	"	ND			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>98.0 %</i>			<i>43-155</i>	<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>

---

## TPH Diesel & Motor Oil

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Diesel	ug/l	ND			50	EPA 8015 MOD	02/17/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
<i>Surrogate: Octacosane</i>		<i>102 %</i>			<i>50-150</i>	<i>"</i>	<i>"</i>	<i>"</i>	<i>"</i>

---

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: ANDY MALONE  
Project: CRESCENT SHELL SP-165

Description: MW-5  
Matrix: Water

Lab ID: 5020154-04

Lab No: 5020154  
Reported: 02/21/05  
Phone: 707-269-0884  
P.O. #

Sampled: 01/30/05 00:00  
Received: 02/03/05 10:51

## TPH Gasoline

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	75.4			50.0	EPA 8015/8260	02/05/05	02/04/05	B5B0143
Benzene	"	9.1			0.5	"	"	"	"
Ethylbenzene	"	9.1			0.5	"	"	"	"
Toluene	"	0.6			0.5	"	"	"	"
Xylenes (total)	"	6.3			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
Surrogate: 4-Bromofluorobenzene		94.6 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	ND			50	EPA 8015 MOD	02/18/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
Surrogate: Octacosane		103 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Attention:** ANDY MALONE  
**Project:** CRESCENT SHELL SP-165

**Matrix:** Water

**Reported:** 02/21/05

**Phone:** 707-269-0884

**P.O. #**

**Lab ID:** 5020154-05

**Sampled:** 01/30/05 00:00

Received: 02/03/05 10:51

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	ND			50.0	EPA 8015/8260	02/05/05	02/04/05	B5B0143
Benzene	"	ND			0.5	"	"	"	"
Ethylbenzene	"	ND			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
Surrogate: 4-Bromofluorobenzene		93.6 %			43-155	"	"	"	"

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Diesel	ug/l	ND			50	EPA 8015 MOD	02/18/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
Surrogate: Octacosane		91.7 %		50-150		"	"	"	"

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: ANDY MALONE

Project: CRESCENT SHELL SP-165

Description: MW-7

Matrix: Water

Lab ID: 5020154-06

Lab No: 5020154  
Reported: 02/21/05  
Phone: 707-269-0884  
P.O. #

Sampled: 01/30/05 00:00

Received: 02/03/05 10:51

## TPH Gasoline

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	ND			50.0	EPA 8015/8260	02/05/05	02/04/05	B5B0143
Benzene	"	ND			0.5	"	"	"	"
Ethylbenzene	"	ND			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
Surrogate: 4-Bromofluorobenzene		91.2 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	ND			50	EPA 8015 MOD	02/18/05	02/04/05	B5B0110
Motor Oil	"	ND			50	"	"	"	"
Surrogate: Octacosane		96.2 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549  
**Attention:** ANDY MALONE  
**Project:** CRESCENT SHELL SP-165

**Lab No:** 5020154  
**Reported:** 02/21/05  
**Phone:** 707-269-0884  
**P.O. #**

### Notes and Definitions

D-01	This sample appears to contain volatile range organics.
D-02	Hydrocarbon pattern present in the requested fuel quantitation range but does not resemble the pattern of the requested fuel.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag). The J flag is equivalent to the DNQ Estimated Concentration flag.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
<	Less than reporting limit
≤	Less than or equal to reporting limit
>	Greater than reporting limit
≥	Greater than or equal to reporting limit
MDL	Method Detection Limit
RL/ML	Minimum Level of Quantitation
MCL/AL	Maximum Contaminant Level/Action Level
mg/kg	Results reported as wet weight
TTLC	Total Threshold Limit Concentration
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leachate Procedure

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Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

2218 Railroad Avenue, Redding, CA 96001 (530) 243-7234 FAX 243-7494

NAME: <b>Sou Pacific</b>		PROJECT NAME: <b>Crescent Shell</b>		PROJECT #: <b>SP-165</b>		LAB #: <b>5020154</b>		
ADDRESS: <b>4612 Greenwood Heights Dr Kneeland, CA 95549</b>		REQUESTED COMP. DATE: <b>2-17-05</b>				# SAMP: <b>6</b>		
		TURN AROUND TIME: STD <input checked="" type="checkbox"/> RUSH <input type="checkbox"/>				PAGE <b>1</b> OF <b>1</b>		
PROJECT MANAGER: <b>Andy Malone</b>		ANALYSES REQUESTED				REP: <b>Global</b>		
PHONE: <b>269-0884</b>						I.D.# <b>T0601508015</b>		
FAX: <b>707 269 0689</b>						SYSTEM #:		
E-MAIL: <b>andy @ sou.pacific.com</b>						CUST. SEAL		
PO #:						ICE		
SPECIAL MAIL <input type="checkbox"/> E-MAIL <input type="checkbox"/> FAX <input type="checkbox"/> <input checked="" type="checkbox"/> EDT						QC = 1 2 3 4		
DATE	TIME	WATER	COMP	SOIL	SAMPLE DESCRIPTION	# OF BOTTLES	LAB ID	REMARKS
1/30/05		X			MW-1	5	1	Please email results to: Greg @ sou.pacific.com sou.pacific @ starband.net andy @ sou.pacific.com
					MW-2		2	
					MW-4		3	
					MW-5		4	
					MW-6		5	
					MW-7		6	
RESERVATIONS		HNO3 <input type="checkbox"/>	H2SO4 <input type="checkbox"/>	NaOH <input type="checkbox"/>	ZnAce/NaOH <input type="checkbox"/>	HCL <input checked="" type="checkbox"/>	Nathio <input type="checkbox"/>	
ANALYSED BY: <b>John Garino</b>		DATE/TIME: <b>1/30/05</b>		RELINQUISHED BY: <b>John Garino</b>		DATE/TIME: <b>1/30/05</b>		
CHECKED BY:		DATE/TIME:		RELINQUISHED BY:		DATE/TIME:		
RECEIVED BY:		DATE/TIME:		RELINQUISHED BY:		DATE/TIME:		
RECEIVED BY LAB: <b>2/3/05 10:51</b>		DATE/TIME:		SAMPLE SHIPPED VIA: <b>UPS</b>		POST BUS FED-EX OTHER		
INSTRUCTIONS, TERMS, CONDITIONS ON BACK.								

## **Appendix B**





# **Standard Operating Procedures**

## **Groundwater Level Measurements and Free Phase Hydrocarbon Measurements**

All SounPacific staff and contractors shall adopt the following procedures any time that groundwater elevations are determined for the purposes of establishing groundwater gradient and direction, and prior to any sampling event.

Wells are to be tested for free phase hydrocarbons (free product) before the first development or sampling of any new well, and in any well that has historically contained free product.

### **Equipment Checklist**

- ☐ Combination water level / free phase hydrocarbon indicator probe (probe)
- ☐ Gauging Data / Purge Calculations Sheet
- ☐ Pencil or Pen/sharpie
- ☐ Disposable Gloves
- ☐ Distilled Water and or know water source on site that is clean
- ☐ Alconox (powder) or Liquinox (liquid) non-phosphate cleaners—do not use soap!
- ☐ Buckets or Tubs for decontamination station
- ☐ Tools necessary to access wells
- ☐ Site Safety Plan
- ☐ This Standard Operating Procedure
- ☐ Notify Job site business that you will be arriving to conduct work.

### **Procedure**

1. Review Site Safety Plan and utilize personal protection appropriate for the contaminants that may be encountered.
2. Access and open all monitoring wells to be measured. Allow wells to equilibrate for approximately 15 minutes before taking any measurements.

3. Decontaminate probe with Alconox or Liquinox solution, and rinse with distilled water.
4. Determine the diameter of the well to be measured and indicate this on the Gauging Data / Purge Calculations Sheet.
5. Words of caution: Please be careful with water level and product meters probes are not attached with high strength material so please make sure to avoid catching the end on anything in the well and make sure not to wind reel to the point that it could pull on the probe. ***If product is suspect in a well, go to step 6, if no product is suspected go to step 7 below.***
6. **When product is present or suspected:** use the product level meter. Clip the static charge clamp to the side of the well casing. Then lower probe into the well through the product/water interface about one foot if possible. Then slowly raise the probe back up through the product/water interface layer and record the level as the tone changes from solid to broken-record this level in the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTP). Continue to raise the probe up through the product until the tone stops completely-record this level on the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTW). Then go to step 8.
7. **When no product is present or suspected:** If no free product is present, record the depth of the water (to the nearest 0.01 foot) relative to the painted black mark on the top of the well casing. Leave the probe in the well just a hair above the water level to ensure the well as equilibrated. As the well rises, the tone will sound. Make sure no increase in water levels have occurred in over a ten-minute period. Water levels can lower as well as rise. Make sure you note when the level you keep lowering the probe to has remained stable for at least ten minutes. Once this has been accomplished, please record this level in the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTW).
8. Turn off the probe, and use the probe to determine the depth to the bottom of the well relative to the top of the well casing. This is the depth to bottom measurement (DTB).
9. Decontaminate probe and tape by washing in an Alconox/Liquinox solution (***read directions on solution for ratio of water to cleanser***) and use the toothbrush provided to remove any foreign substance from the probe and tape. Then triple rinse probe and tape with clean water and then proceed to take measurements in the next well.
10. If sampling is to occur, proceed to implement SounPacific's Standard Operating Procedure for Monitoring Well Purging and Sampling. If no sampling is to be performed, close and secure all wells and caps.



# Standard Operating Procedures

## Monitoring Well Purging and Groundwater Sampling

All SounPacific employees and contractors shall adopt the following procedures any time that groundwater samples are to be taken from an existing groundwater monitoring well.

Prior to the implementation of these procedures, the groundwater level **MUST** be measured and the presence of free phase hydrocarbons determined in accordance with SounPacific's Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements.

### Equipment Checklist

- ☐ **Gauging Data / Purge Calculations Sheet used for water level determination**
- ☐ Chain of Custody Form
- ☐ pH/ Conductivity / Temperature meter
- ☐ Pencil or Pen
- ☐ Indelible Marker
- ☐ Calculator
- ☐ Disposable Gloves
- ☐ Distilled Water
- ☐ Alconox/liquinox liquid or powdered non-phosphate cleaner
- ☐ Buckets or Tubs for decontamination station
- ☐ Bottom-filling bailer or pumping device for purging
- ☐ Disposable bottom-filling bailer and emptying device for sampling
- ☐ String, twine or fishing line for bailers
- ☐ Sample containers appropriate for intended analytical method (check with lab)
- ☐ Sample labels
- ☐ Site Safety Plan
- ☐ Tools necessary to access wells
- ☐ Drum space on site adequate for sampling event

## **SounPacific Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements, Page 2 of 3**

### **Procedure**

1. Review Site Safety Plan and utilize personal protection appropriate for the contaminants that may be encountered.
2. Measure groundwater levels and check for the presence of free product in accordance with the Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements.

### **Purging**

3. Calculate and record the volume of standing water in each well using the information provided on the Gauging Data / Purge Calculations sheet.  
 $(DTB-DTW) \times \text{Conversion Factor} = \text{Casing Volume}$ .
4. The purge volume shall be at least three times and no more than seven times the volume of standing water (the casing volume).
5. Purge the well by bailing or pumping water from the well into a calibrated receptacle, such as a five gallon bucket or tub with markings to indicate one gallon increments. Collect purgeate in a 55 gallon labeled drum and store on site. Drum labels should include the date, contents, site number, and SounPacific's name and telephone number.
6. Take measurements of pH, conductivity, temperature, and visual observations to verify the stabilization of these parameters. At least five measurements of these parameters should be made throughout the purging process. The parameters shall be considered stabilized if successive measurements vary by less than 0.25 pH units, 10% of conductivity in  $\mu\text{S}$ , and  $1^{\circ}\text{C}$  (or  $1.8^{\circ}\text{F}$ ). Continue purging until at least three times the casing volume has been removed, and the measured parameters have stabilized as indicated above. Do not exceed seven casing volumes.
7. Take a final depth to groundwater measurement and calculate the casing volume of the recharged well. Ideally, the casing volume should have recharged to at least 80% of the original measured casing volume before sampling commences. If due to slow recharge rates it is not feasible to wait for the well to fully recharge, then note this on the Gauging Data / Purge Calculation Sheet and proceed to sample following the procedure below.

## **Sampling**

8. **After completing groundwater measurement, and checking for free product if necessary, in accordance with SounPacific's Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements, and after purging monitoring wells as described above, groundwater samples may be collected.**
9. Slowly lower a clean, previously unused disposable bailer into the well water approximately half of the bailer length, and allow the bailer to slowly fill.
10. Withdraw the full bailer from the monitoring well and utilize the included (clean and unused) bottom-emptying device to fill the necessary sample containers, and seal the container with the included PTFE (Teflon) lined cap.
11. When filling VOAs, fill the VOA completely full, with the meniscus rising above the rim of the bottle. Carefully cap the VOA and invert it and gently tap it to determine whether air bubbles are trapped inside. If the VOA contains air bubbles, refill the VOA and repeat this step.
12. All samples shall be labeled with the Sample ID, the Sample Date, and the Sample Location or Project Number. Use an indelible marker for writing on sample labels.
13. Record all pertinent sample data on the Chain of Custody.
14. Place samples in an ice chest cooled to 4°C with ice or "blue ice". Bottles should be wrapped in bubble wrap, and VOA's should be inserted in a foam VOA holder to protect against breakage. Samples are to be kept at 4°C until delivered to the laboratory. Any transference of sample custody shall be indicated on the Chain of Custody with the appropriate signatures as necessary.
15. Utilize clean, previously unused gloves, bailer and line, and bottom-emptying device for each well sampled.
16. When finished with all sampling, close and secure all monitoring wells.
17. Leave the site cleaner than when you arrived and drive safely.

# Appendix C

## GAUGING DATA/PURGE CALCULATIONS

Job Site: Crescent ShellJob No.: SP-165Event: 11<sup>th</sup> Quarter/xDate: 1/30/05

WELL NO.	DIA. (in.)	DTB (ft.)	DTW (ft.)	ST (ft.)	CV (gal.)	PV (gal.)	SPL (ft.)	Bailer Loads	Notes
MW-1	2	13.40	6.76	6.64	1.06	3.18			
MW-2	2	13.75	8.37	5.38	.86	2.58			
MW-4	2	18.91	7.54	11.37	1.82	5.46			
MW-5	2	18.79	8.26	10.53	1.68	5.04			
MW-6	2	18.70	9.26	9.44	1.51	4.53			
MW-7	2	18.31	6.84	11.47	1.84	5.52			

## Explanation:

DIA. = Well Diameter

DTB = Depth to Bottom

DTW = Depth to Water

ST = Saturated Thickness (DTB-DTW)

CV = Casing Volume (ST x cf)

PV = Purge Volume (standard 3 x CV,  
well development 10 x CV)

SPL = Thickness of Separate Phase Liquid

## Conversion Factors (cf):

2 in. dia. well cf = 0.16 gal./ft.

4 in. dia. well cf = 0.65 gal./ft.

6 in. dia. well cf = 1.44 gal./ft.

Sampler:

## Well Gauging/Sampling Report

Sheet 1 of 6

Date: 1/30/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-1

Analyses Tested: BTEX, 5 OXYS, TPHg, TPHd/mo

Sample Containers: (3) HCl VOAS, (2) 1-L Amber bottles

Purge Technique: ☒ Bailer ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes:
12:13	6.76		No Sheen
12:33	6.76		↓
	End		

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (µs/cm)	DO (mg/L)	DO (%)	
12:56	0	6.91	58.98	.837	.78	7.7	
1:00	1.06	6.94	58.93	.840	.49	4.9	
1:03	2.12	6.95	59.09	.859	.40	4.0	
1:08	3.18	7.02	59.25	.840	.32	3.1	

Field Scientist: Jeff Graham





## Well Gauging/Sampling Report

Sheet 2 of 6

Date: 1/30/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-2

Analyses Tested: BTEX, S-Oxys, TPHg, TPH d/MO

Sample Containers: (3) HCL VOA'S, (2) 1-L Amber bottles

Purge Technique: ☒ Bailer ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes:
12:18	8.37		No sheen
12:38	8.37		↓
	End		

### Field Measurements

Time	Total Vol. Removed/(gal)	pH	Temp/(F)	Cond./(ms/cm)	DO/(mg/L)	DO/(%)	
1:19	0	7.29	58.66	.303	.34	3.4	
1:24	.86	7.14	59.20	.306	.29	2.7	
1:27	1.72	7.05	59.27	.306	.23	2.3	
1:31	2.58	7.02	59.28	.301	.23	2.3	

Field Scientist: Jeff Gaines

## Well Gauging/Sampling Report

Sheet 3 of 6

Date: 1/30/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-4

Analyses Tested: BTEK, S-Oxys, TP4g, TPH d/mo

Sample Containers: (3) HCl VOA's, (2) 1-L Amber bottles

Purge Technique: ☒ Bailor ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:21	7.55		Sheen detected
12:42	7.54		↓
	End		

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ms/cm)	DO (mg/L)	DO (%)	
1:40	0	7.20	61.32	.187	1.09	11.1	
1:45	1.82	7.18	61.86	.184	.72	7.4	
1:50	3.64	7.17	61.92	.187	.87	8.9	
1:54	5.46	7.17	61.88	.187	.91	9.3	

Field Scientist: Jeff Gainer

## Well Gauging/Sampling Report

Sheet 4 of 6

Date: 1/30/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-5

Analyses Tested: BTEX, S-oxys, TPHg, TPHd, MO

Sample Containers: (3) HCl vials, (2) 1-L Amber bottles

Purge Technique: ☒ Bailer ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:23	8.26		Sheen detected
12:45	8.26		↓
	End		

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ns/cm)	DO (mg/L)	DO (%)	
2:03	0	7.21	60.65	.169	.28	2.8	
2:08	1.68	7.15	61.65	.187	.26	2.6	
2:13	3.36	7.13	61.71	.184	.26	2.6	
2:18	5.04	7.14	61.66	.190	.25	2.5	

Field Scientist: Jeff Gashes





# Well Gauging/Sampling Report

Sheet 5 of 6

Date: 1/30/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-6

Analyses Tested: BTEX, 5-oxy's, TPHg TPHd/mo

Sample Containers: (3) HCl VOA's, (2) 1-L Amber bottles

Purge Technique: ☒ Bailor ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

## Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:26	9.27		Sheen detected
12:48	9.26		↓
	End		

## Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ms/cm)	DO (mg/L)	DO (%)	
2:30	0	7.12	57.80	.133	1.44	14.0	
2:34	1.51	7.12	58.58	.156	1.27	12.6	
2:37	3.02	7.10	58.82	.163	1.23	12.1	
2:42	4.53	7.03	58.92	.163	1.19	11.8	

Field Scientist: Jeff Grimes

## Well Gauging/Sampling Report

Sheet 6 of 6

Date: 1/20/05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-7

Analyses Tested: BTEX, 5-oxy's, TPHg, TPHd/mo

Sample Containers: (3) HCl VOA's, (2) 1-L Amber bottles

Purge Technique: ☒ Bailer ☐ Pump

Sounder Used: ☐ Water Meter ☒ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:29	6.84		No Sheen
12:51	6.84		↓
	End		

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ms/cm)	DO (mg/L)	DO (%)	
2:55	0	6.92	56.82	.153	1.50	14.4	
2:59	1.84	6.96	58.50	.170	1.47	14.5	
3:06	3.68	6.96	57.92	.170	1.48	14.5	
3:11	5.52	6.97	58.96	.175	1.45	14.4	

Field Scientist: Jeff Gaines